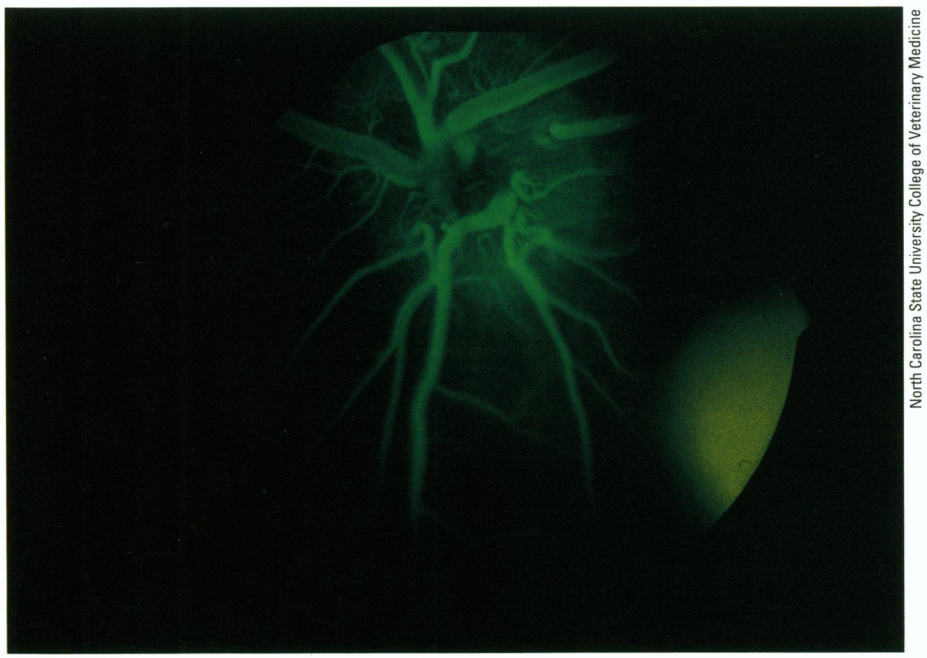
An attention to health then should take place of every other object. The time necessary to secure this by active exercises, should be devoted to it in preference to every other pursuit.

Thomas Jefferson, letter to Thomas Mann Randolph, Jr., 6 July 1787

# Forum

## A Second Look at Methanol

Responding to the mandate of the amendments to the Clean Air Act, the federal government, the auto industry, and other groups are looking to develop cleaner fuels such as methanol. Although the risks to humans of blindness and death associated with ingestion of methanol (usually in the form of "wood alcohol") have been known for some time, the increasing interest in its development as an alternative fuel has prompted scientists to consider the potential health effects of methanol inhalation.



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**The optic nerve and eye** are methanol targets. Scientists are now looking at other potential targets.

In the body, methanol is metabolized to formate, which becomes toxic at high concentrations. Formate is then detoxified to carbon dioxide. Preliminary studies conducted by scientists at the Chemical Industry Institute of Toxicology, which analyzed formate levels after methanol exposure, indicate the risk to most people would be minimal. In one study monkeys were exposed to concentrations of methanol from 200 ppm (the threshold limit value or TLV; the TLV is the maximum exposure recommended for humans in the workplace) to 2000 ppm for 6 hours. Results showed that formate levels in the blood were no greater than normal levels.

A subsequent study was conducted using radioactive methanol to distinguish between formate due to methanol exposure and formate normally found in the body. Preliminary results indicate that the maximum blood formate concentrations due to methanol exposure at or below the TLV were 100 to 1000 times lower than normal formate levels and 1000 to 10,000 times lower than toxic levels of formate. These data suggest that the body is efficient in removing formate resulting from inhalation of low levels of methanol. Consequently, exposure to methanol at the TLV should not pose an unacceptable risk in healthy individuals.

There is, however, evidence indicating that the developing fetus may be at a much greater risk for adverse health effects from maternal inhalation of methanol. A recent report in *Teratology* (volume 47) suggests that exposure to high levels of methanol may cause birth defects in pregnant rats. It is unclear whether the defects are a direct result of methanol, formate, or some other metabolite. If the defects are due to methanol directly, studies of formate levels may not provide an accurate measure of inhalation risk.

If, in fact, formate is found to be the culprit, its effects on pregnant women may be exacerbated by folic acid deficiencies in these women. Folic acid, found in foods such as broccoli and spinach, is a critical cofactor in detoxification of methanol. In the absence of folic acid or in cases of folic acid deficiency, formate accumulates in the blood, causing a pH imbalance which can cause toxicity. An article published in the *New England Journal of Medicine* (volume 327, December 1992) estimated that at least 15 to 30% of pregnant women in the United States and Europe, and as much as 50% of pregnant women in India, have some form of folic acid deficiency due to an increased rate of folic acid breakdown during pregnancy. Scientists at CIIT plan to study whether inhalation of methanol poses a health risk to these individuals. Says one CIIT scientist of methanol exposure, "We still need to examine the issue for potentially sensitive individuals so that we don't trade one form of risk for another."

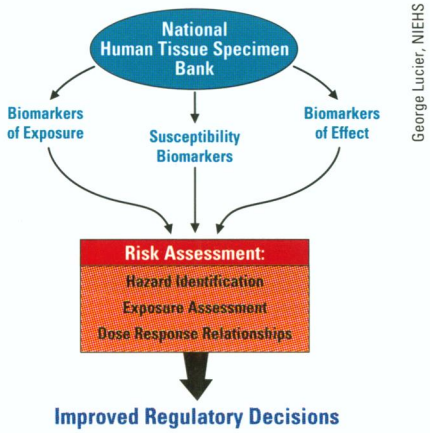
## Banking on Future Research

There is an increasing need for national monitoring and assessment of the actual amounts of environmental pollutants that human populations are carrying in their bodies—a need which may best be met through a national human tissue specimen bank. Such was the conclusion of a group of scientists who met in North Carolina recently to examine these issues.

Participants at the Human Tissue Monitoring and Specimen Banking Symposium, which brought together scientists and policy makers from agencies such as EPA, NIEHS, the National Cancer Institute, the National Center for Health Statistics, and the Centers for Disease Control, met to provide a state-of-the-art overview of human exposure assessment, biomonitoring techniques, and advances in human tissue specimen banking. Discussion at the symposium encompassed the need for monitoring and banking pro-

grams, sampling design and analysis, specimen collection and management, application of specimen data to biomarkers and risk assessment, and ethical considerations such as confidentiality, rights of human subjects, and regulation of uses of data.

A major portion of the conference was devoted to identifying and discussing the potential benefits and uses of a human tissue specimen banking program. Tissue specimens collected as part of national surveys or particular epidemiologic studies would allow scientists to measure amounts of known chemical contaminants in human tissues and help identify new or previously unrecognized hazards, identify population groups (e.g., by age, sex, or geographic location) that may be at increased risk due to high body burdens, and conduct research in related areas such as determination of body burdens, distribution of chemicals in various body tissues, and procurement, storage, and analysis of human tissues.




George Lucier, NIEHS

**A national human tissue specimen bank** would be a resource for future studies.

Perhaps the greatest potential benefit of a national specimen bank, however, may be as a resource for future environmental and toxicological studies. Data from future studies might be used to establish trends in body burdens of chemicals that result from changes in manufacture, use, and disposal patterns, thus enabling regulators to monitor programs to control specific chemical hazards. Future studies might also include measurement of toxins not originally studied, baseline measurements for chemicals not currently considered toxic or not yet invented, and measurements using new or more sensitive analytic techniques yet to be developed. These new techniques may frequently involve the characterization of biomarkers, which could be more predictive of disease outcomes.

A working group of selected conference participants estimated that the cost of properly conducting and maintaining such a specimen bank would be between $20 and $50 million a year. However, they also estimated that the costs of not having a bank would likely be far greater because public health threats from chemical exposures would not be detected until significant disease outcomes become evident.

## EPA Elevation Slow

The proposal by the Clinton Administration and some Members of Congress to elevate the Environmental Protection Agency from a federal executive agency to the departmental level is not moving as quickly as anticipated. This proposal would give EPA cabinet status and has broad support in Congress, but considerable debate has arisen concerning how the new Department of Environment would carry out its responsibilities.

The Clinton Administration supports bills introduced in the House and the Senate that would elevate EPA to cabinet level and abolish the White House Council on Environmental Quality. Almost all of the duties of CEQ would be transferred to the new department. These bills have generated concern in many federal agencies and in some environmental groups about transferring responsibility from CEQ for final decisions on disputes related to Environmental Impact Statements involving federal construction projects. The White House restated its position and agreed to continue to resolve such disputes. Environmentalists voiced fears that if CEQ were abolished, they would be denied access to the White House on critical issues. The establishment and staffing of a new environmental office in the White House has mollified some but not all of this opposition.

The simplest proposal, known as a "clean bill," would redefine the EPA in existing legislation as a department. Such a bill has been introduced and has the support of key Republicans in the House of Representatives. This approach would replace all references to EPA with the term "department" in the laws that created the EPA and describe its responsibilities. This bill does not address the perceived need to correct shortcomings in the existing structure and mode of operation of EPA. Some members of Congress who want to take advantage of this opportunity to redress these problems in the legislation that elevates EPA. These members are drafting such a bill, which will certainly be controversial.

Representative John Dingell (D-Michigan), chair of the House Committee on Energy and Commerce, which has jurisdiction over EPA, is reported as being opposed to the proposed elevation. He has been a persistent critic of EPA and has stated he does not believe that elevation to cabinet status is warranted. Dingell has been careful not to rule out passage of some version of an EPA elevation bill, but his personal concerns cast further doubt on hopes for rapid elevation of the agency.

A bill passed in the Senate on May 4, introduced by John Glenn (D-Ohio), reflects the desires of the Clinton Administration. The Senate approved the elevation of EPA by a vote of 79 to 15. The bill does not change the basic structure or function of EPA. It does shift the duties of CEQ to EPA and allows an expanded role for protection of the global environment.

## Agencies May Merge on Environment

Congressmen Bob Walker (R-Pennsylvania) and George Brown (D-California) have introduced a bill in Congress that would merge the Department of Energy, the Environmental Protection Agency, and the National Aeronautics and Space Administration. In addition, the proposed legislation would transfer the National Institute of Standards and Technology and the National Oceanographic and Atmospheric Administration from the Department of Commerce to the new agency.

Such a reorganization of federal energy, environment, space research, and regulatory programs would radically change the structure of the federal Executive Branch and the Committees of the Senate and House of Representatives. A similar bill was introduced in the last session of Congress but was not enacted. The reintroduction is given little chance of approval and is sure to generate significant opposition. Its sponsors are senior members of Congress and the ranking members of the House Science, Space, and Technology Committee. Brown is highly regarded as an expert on federal research and development policy and has recently made provocative presentations on the subject of reorganization at meetings of scientists.

## Cleaner Air May Mean Worse Health

The 1990 Clean Air Act requires reformulation of gasoline sold in areas of the country that do not meet the EPA's ambient air standard for carbon monoxide. Last winter some petroleum manufacturers, in an attempt to comply with the act, added 15% methyl tertiary butyl ether (MTBE) to gasoline sold in 39 nonattainment areas cited by the law. Although preliminary data showed a drop in carbon monoxide